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(54) **Door structure for vehicle**

(57) One large opening (1) formed in a car body side portion and continuous in a back-and-forth direction is opened and closed by front and rear side doors (11, 12). When the side doors (11, 12) are closed, a lap portion (15) is formed where a rear end of the front side door (11) overlaps a front end of the rear side door (12) externally in a direction of car width. A reinforcing member (25) extending in a vertical direction is disposed on the

rear side door (12) in the vicinity of the lap portion (15). The rear end of a front impact bar (27) disposed in the front side door (11) extends to the lap portion (15). The front end of a rear impact bar (26) disposed in the rear side door (12) is connected to the reinforcing member (25).

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direction of the car body is disposed in the front side door (11), and a rear end of the front impact bar (27) extends to the lap portion (15).

[0012] According to the above arrangement, when side collision occurs, the front impact bar itself prevents or reduces deformation of the front side door toward the car compartment. In addition, the rear end of the front impact bar extends to the overlapping portion with the rear side door, that is, to a high-rigidity portion. Thus, a large deformation of the front side door into the car compartment is further prevented or reduced while the rigidity of the front and rear side doors in the vicinity of their boundary is increased.

[0013] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, a reinforcing member (25) is disposed in the front end of the rear side door (12) to extend in a vertical direction, a rear impact bar (26) is disposed in the rear side door (12) to extend in the back-and-forth direction, and a front end of the rear impact bar (26) extends to the reinforcing member (25).

[0014] According to the above arrangement, when side collision occurs, the rear impact bar itself prevents or reduces large deformation of the rear side door toward the car compartment. In addition to an increase in rigidity of the lap portion, the front end of the rear impact bar extends to the high-rigidity reinforcing portion. Thus, a large deformation of the rear side door into the car compartment is further prevented or reduced.

[0015] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the rear end of the front impact bar (27) and the front end of the rear impact bar (26) extend to the lap portion (15) or to a portion in the vicinity of the lap portion (15) to be close to each other.

[0016] According to the above arrangement, the front and rear impact bars can be disposed close to each other, that is, the rigidity of the front and rear side doors in the vicinity of their boundary is increased, and a side-colliding force is received by both the front and rear impact bars as much as possible. Thus, a large deformation of the side door into the car compartment can be prevented or reduced.

[0017] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the reinforcing member (25) forms a closed section, and the front end of the impact bar (26) is bonded to that portion of the reinforcing member (25) which forms the closed section, to abut against it externally in the direction of car width.

[0018] According to the above arrangement, an external force acting on the rear impact bar in the case of side collision is received by the reinforcing member as well. Thus, deformation of the side door, particularly of the rear side door, into the car compartment can be prevented

ed further effectively.

[0019] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the rear end of the front impact bar (27) overlaps that portion of the reinforcing member (25) which forms the closed section in the direction of car width.

[0020] According to the above arrangement, an external force acting on the front impact bar in the case of side collision is also received by the reinforcing member. Thus, deformation of the front side door into the car compartment can be prevented or reduced further effectively.

[0021] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, a reinforcing member (25) is disposed in the front end of the rear side door (12) to extend in a vertical direction to form a closed section, and the rear end of the front impact bar (27) extends to a portion in the vicinity of the reinforcing member (25).

[0022] According to the above arrangement, an external force acting on the front impact bar in the case of side collision is also received by the front end of the rear side door reinforced by the reinforcing member. Thus, deformation of the front side door into the car compartment can be prevented or reduced further effectively.

[0023] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the rear side door (12) is swung about a hinge (14) provided at a rear end thereof as a center to open forward, the front side door (11) is swung about a hinge (13) provided at a front end thereof as a center to open backward, and in an overlapping state, the front end of the rear side door (12) is covered by the rear end of the front side door (11) externally in the direction of car width, so the rear side door (12) can be opened only when the front side door (11) is open.

[0024] According to the above arrangement, the front and rear side doors form a so-called double-leafed hinged-type structure. This is preferable, when both the front and rear side doors are opened, for opening the car body side portion very large. This is also preferable in preventing the rear side door from being opened accidentally.

[0025] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, in a closed state, the rear side door (12) is locked on the car body at the front end thereof, and in the closed state, the front side door (11) is locked on the front end of the rear side door (12).

[0026] According to the above embodiment, the front side door can be locked on the car body through the rear side door.

[0027] With the above arrangement as a premise, a door structure for a vehicle according to the present in-

backward, and in an overlapping state, the front end of the rear side door (12) is covered by the rear end of the front side door (11) externally in the direction of car width, so the rear side door (12) can be opened only when the front side door (11) is open.

[0043] This arrangement is preferable when the front and rear side doors are to form a so-called double-leafed hinged door-type structure, so when both the front and rear side doors are opened, the car body side portion can be opened very largely. This arrangement is also preferable in preventing the rear side door from being opened carelessly.

[0044] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, in a closed state, the rear side door (12) is locked on the car body at the front end thereof, and in the closed state, the front side door (11) is locked on the front end of the rear side door (12).

[0045] According to this arrangement, the front side door can be locked on the car body through the rear side door.

[0046] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, a lower end of the opening (1) forms a side sill (2), an upper end of the opening (1) forms a side end of a roof panel (3), and in the closed state, the rear side door (12) is locked on the side sill (2) and the side end of the roof panel (3).

[0047] This arrangement is preferable when locking the rear side door on the car body at its upper and lower portions, so the locking operation can become firm.

[0048] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the front end of the rear side door (12) is reinforced by a reinforcing member (25) extending long throughout almost an entire length of the rear side door (12) in a vertical direction.

[0049] This arrangement is very preferable when remarkably increasing the rigidity of the portion in the vicinity of the lap portion, so the various types of effects described above are achieved more effectively.

[0050] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, a front end of the front impact bar (27) is disposed to be higher than the rear end thereof, and a rear end of the rear impact bar (26) is disposed to be higher than the front end thereof, the rear end of the front impact bar (27) and the front end of the rear impact bar (26) are arranged close to each other, and the front end of the front impact bar (27) and the rear end of the rear impact bar (26) are at substantially the same height.

[0051] According to the above arrangement, when the door is closed, a large, partition-less opening can be formed in the car body side portion. Also, the strength

of the car body side portion can be ensured against an impact which is applied to the car body side portion in the case of side collision or the like.

[0052] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the front impact bar (27) is arranged to be inclined downward to the right from the front end thereof to the rear end thereof, and the rear impact bar (26) is arranged to be inclined upward to the right from the front end thereof to the rear end thereof, so as to form a substantial V shape when seen from the car body side portion.

[0053] This arrangement can increase the door rigidity.

[0054] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the front end of the front side door (11) is supported to the car body by a pair of hinges (13) vertically spaced apart from each other by a predetermined distance, and the front end of the front impact bar (27) is attached between the hinges (13).

[0055] According to the above arrangement, the front end of the impact bar can be attached to a high-rigidity portion.

[0056] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the rear end of the rear impact bar (26) is attached below a hinge (14) that supports the rear side door (12) at a rear end thereof.

[0057] This arrangement can increase the door rigidity below the hinge.

[0058] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the car body side portion has a partition-less opening through which an inner side and outer side of a car compartment communicate with each other when the front side door (11) and rear side door (12) are closed.

[0059] According to this arrangement, the front door and rear door can form a double-leafed hinged door-type structure, so the opening of the car body side portion can make the passenger feel more open to the outside and can get on and off the car easily.

[0060] With the above arrangement as a premise, a door structure for a vehicle according to the present invention has the following arrangement. More specifically, the rear end of the front side door (11) and the front end of the rear side door (12) have engaging portions (31, 41) that engage with each other when the front side door (11) and the rear side door (12) are closed.

[0061] According to this arrangement, the door can be held not to open when an impact is applied to the car body side portion in the case of side collision or the like.

[0062] With the above arrangement as a premise, a door structure for a vehicle according to the present in-

midway by a center pillar but is continuous in the back-and-forth direction. A surrounding rim that defines the opening 1 has the following arrangement. More specifically, a lower end 1a of the front side door 1 is formed of a side sill 2 serving as a car body strength member. An upper end 1b of the opening 1 is formed of a side end (roof reinforcement rail) of a roof panel 3. A front end 1c of the opening 1 is formed of a front pillar 4 and (the rear-side end of) a front fender 5. A rear end 1d of the opening 1 is formed of a rear pillar 6 and (the rear end of) a rear fender 7.

[0075] A front seat 9 and rear seat 10 are disposed in a car compartment 8. The opening 1 is opened and closed by a front side door 11 and rear side door 12. The front side door 11 serves as an entrance/exit for the passenger on the rear seat 10, and opens backward as it is swung about hinges 13 provided to its front end as the center (about an axis extending substantially vertically as the center). The rear side door 12 serves as an entrance/exit for the passenger on the rear seat 10, and opens forward as it is swung about hinges 14 provided to its rear end as the center (about an axis extending substantially vertically as the center).

[0076] When the front and rear side doors 11 and 12 are closed, they partially overlap each other in the direction of car width, to form a lap portion 15. More specifically, with the rear side door 12 being closed, when the front side door 11 is closed, its rear end overlaps the front end of the rear side door 12 to cover it externally in the direction of car width (this will be described later in detail). Thus, when the front side door 11 is closed, the rear side door 12 cannot be opened as it is interrupted by the front side door 11. The rear side door 12 can be opened provided that the front side door 11 is open.

[0077] The front end of the rear side door 12 is locked on the car body at upper and lower portions. More specifically, the upper portion of the rear side door 12 is locked on the roof panel 3 by an upper locking unit 21. The lower portion of the rear side door 12 is locked on the side sill 2 by a lower locking unit 22.

[0078] The front side door 11 is locked to the car body through the rear side door 12. More specifically, a substantially middle portion in the vertical direction of the rear end of the front side door 11 is locked on a substantially middle portion in the vertical direction of the front end of the rear side door 12 by a locking unit 23.

[0079] When the front side door 11 is to be opened from the outside of the car, a door knob 24 provided to the rear end of the outer surface of the front side door 11 is operated to unlock the locking unit 23. To open the rear side door 12, after the front side door 11 is opened, a door knob 20 provided to the inner side of the car compartment for the rear side door 12 is operated, so the upper locking units 21 and 22 are unlocked. In other words, the rear side door 12 has no door knob that can be directly operated from the outside of the car compartment.

[0080] The rear side door 12 integrally has a vertically

extending thin reinforcing member 25 at its front end. The reinforcing member 25 extends throughout almost the entire length of the rear side door 12 in the vertical direction to form a closed section. Namely, the reinforcing member 25 is located at the lap portion 15 of the front and rear side doors 11 and 12 or in its vicinity. In other words, when the rear side door 12 is closed, the reinforcing member 25 substantially serves as a center pillar. Hence, when the rear side door 12 is closed, the upper end of the reinforcing member 25 is located immediately close to the side end of the roof panel 3 on the outer side in the direction of car width, and the lower end of the reinforcing member 25 is located immediately near the side sill 2 on the outer side in the direction of car width.

[0081] In the rear side door 12, an impact bar 26 serving as a strength member extending in the back-and-forth direction is disposed at a comparatively low position. The impact bar 26 is integrated with the lower end of the reinforcing member 25 by welding or the like as its front end abuts against the lower end of the reinforcing member 25 externally in the direction of car width.

[0082] An impact bar 27 serving as a strength member extending in the back-and-forth direction is also disposed in the front side door 11. The rear end of the impact bar 27 is located immediately close to the reinforcing member 25. In this manner, the strength members, e.g., the reinforcing member 25, the front end of the impact bar 26, and the rear end of the impact bar 27, are concentrated at the lap portion 15 of the front and rear side doors 11 and 12, so the rigidity of the lap portion 15 becomes as large as possible.

[0083] The impact bars 26 and 27 connect the upper and lower portions of the car body with diagonals, while they extend in the respective doors in the back-and-forth direction of the car body through estimated side collision regions (regions defined as a car body vertical region H and car body back-to-forth region G) of the car body side portion corresponding to almost the heights of the bumpers of other vehicles, so they increase the door rigidity of the corresponding regions.

[0084] The impact bars 26 and 27 are made of a steel stock, aluminum, or other materials having a desired strength, and are firmly attached to the inner sides of the rear and front side doors 12 and 11, to ensure the strength of the car body side portion against an impact applied to the car body side portion.

[0085] The front end of the impact bar 27 of the front side door 11 is disposed to be higher than the rear end thereof. The rear end of the impact bar 26 of the front side door 11 is disposed to be higher than the front end thereof. The rear end of the impact bar 27 of the front side door 11 and the front end of the impact bar 26 of the rear side door 12 are close to each other. The front end of the impact bar 27 of the front side door 11 and the rear end of the impact bar 26 of the front side door 11 are at almost the same height. The impact bar 27 of the front side door 11 is arranged to be inclined down-

[0099] The lower portion of the front end of the rear side door 12, more specifically, the thick portion thereof where the inner panel 32 and the flange of the reinforcing member 25 overlap forms the engaging portion 31 (described above). The engaging portion 31 is substantially formed of a pin member serving as a projection projecting inwardly in the direction of car width. The engaging portion 31 formed of the pin member has a flange 31a on its proximal end side, and a male screw 31b on its outer side in the direction of car width with respect to the flange 31a. The male screw 31b extends through the inner panel 32 and the flange of the reinforcing member 25. A lock nut 37 threadably engaging with the male screw 31b and the flange 31a sandwich the inner panel 32 and the flange of the reinforcing member 25. Hence, the engaging portion 31 is fixed.

[0100] The side sill 2 has an engaging target portion 38 to correspond to the engaging portion 31. More specifically, as is already known, the side sill 2 is formed of an inner panel 2A, outer panel 2B, and reinforcement 2C to have two closed section structures in the direction of car width. The engaging target portion 38 is fixed astride the outer panel 2B and reinforcement 2C. The engaging target portion 38 is formed of a bottomed cylindrical member extending in the direction of car width, and has a recess or hole which is open to the outer side in the direction of car width. This recess or hole has a diameter which gradually increases toward the outer side in the direction of car width. The engaging target portion 38 is firmly fixed to and held by the side sill 2, so it will not be easily displaced with respect to the side sill 2 inwardly in the direction of car width.

[0101] When the rear side door 12 is closed, the engaging portion 31 is fitted in the engaging target portion 38. In the case of side collision, when a large external force acts on the rear side door 12 toward the car compartment 8, the engaging portion 31 is locked by the engaging target portion 38, that is, is caught by the engaging target portion 38, so it will be prevented from being largely displaced with respect to the side sill 2 inwardly in the direction of car width.

(3) Explanation on Front Side Door (Figs. 1 to 3, 6 to 10, 18, and 19)

[0102] The front side door 11 will now be described in detail. As is already known, the front side door 11 is formed of an inner panel 42 and outer panel 43 to have a closed section (Figs. 6, 8, and 9).

[0103] The inner panel 42 integrally has reinforcements 44 and 45 at its front and rear ends, respectively (Figs. 8 and 18). The impact bar 27 described above is disposed astride the reinforcements 44 and 45. More specifically, the impact bar 27 has a sectional shape as shown in, e.g., Fig. 7. The front end of the impact bar 27 is integrated with the reinforcement 44 through a door check (small reinforcing plate) 46. The rear end of the impact bar 27 is integrated with the reinforcement 45.

Although not shown, the locking unit 23 (described above) is provided to almost the middle portion in the vertical direction of the rear end face of the outer panel 43 (this corresponds to the striker 36 of the rear side door 12).

[0104] The door check 46 of the reinforcement 44 has an opening degree adjusting member 71 which controls to stop the door at predetermined opening degrees when the door is being opened (Fig. 19).

[0105] The front side door 11 has the engaging portion 41 (described above) at the lower portion of its rear end, more specifically, at a position corresponding to the projection 2a of the side sill 2 (described above) or in its vicinity. The engaging portion 41 is substantially formed of a pin member serving as a projection projecting inwardly in the direction of car width. The engaging portion 41 formed of the pin member has a flange 41a on its proximal end side, and a male screw 41b on its outer side in the direction of car width than the flange 41a. The male screw 41b extends through the inner panel 42. A lock nut 48 threadably engaging with the male screw 41b and the flange 41a sandwich the inner panel 42. Hence, the engaging portion 41 is fixed.

[0106] The side sill 2 has an engaging target portion 49 to correspond to the engaging portion 41. More specifically, as shown in Fig. 9, the engaging target portion 49 is fixed astride the outer panel 2B and reinforcement 2C of the side sill 2. The engaging target portion 49 is formed of a bottomed cylindrical member extending in the direction of car width, and has a recess or hole which is open to the outer side in the direction of car width. This recess or hole has a diameter which gradually increases toward the outer side in the direction of car width. The engaging target portion 49 is firmly fixed to and held by the side sill 2, so it will not be easily displaced with respect to the side sill 2 inwardly in the direction of car width.

[0107] When the front side door 11 is closed, the engaging portion 41 is fitted in the engaging target portion 49. In the case of side collision, when a large external force acts on the front side door 11 toward the car compartment 8, the engaging portion 41 is locked by the engaging target portion 49, that is, is caught by the engaging target portion 49, so it will be prevented from being largely displaced with respect to the side sill 2 inwardly in the direction of car width.

(4) Explanation on Mutual Relationship Between Front and Rear Side Doors, Their Modification, and Retractor (Figs. 1 to 3, 6, 10, and 11)

[0108] When the front and rear side doors 11 and 12 are closed, the lap portion 15 is formed as shown in Fig. 6, in which the rear end of the front side door 11 is located on the outer side of the front end of the rear side door 12 in the direction of car. At this time, the rear end of the impact bar 27 of the front side door 11 is located close to the lap portion 15. Namely, when seen from the

inner cables 62a and 63a are pulled to unlock the locking units 21 and 22.

[0117] The door knob 20 has a pair of upper and lower legs 20b and 20c extending substantially horizontally, and the leg 20b further has a long pressing piece 20d. The legs 20b and 20c extend through the cover member 67 to the outside in the direction of car width. The door knob 20 is attached at its legs 20b and 20c with an attaching pin 68 extending in the vertical direction, to be swingable about an axis extending substantially in the vertical direction with respect to the board 65 as the center.

[0118] The pressing piece 20d of the door knob 20 opposes a pressing target portion 66a formed on the swing lever 66 to be able to abut against it (Figs. 14 and 15). When the operating portion 20a of the door knob 20 is largely displaced forward (arrow S1), the pressing piece 20d of the door knob 20 presses the pressing target portion 66a of the swing lever 66, so the swing lever 66 swings in the direction of the arrow S2. Hence, the upper and lower locking units 21 and 22 are unlocked.

[0119] The present invention is not limited to the above embodiments and various changes and modifications can be made within the spirit and scope of the present invention. Therefore, to apprise the public of the scope of the present invention the following claims are made.

Claims

1. A door structure for a vehicle, in which one opening (1) formed in a car body side portion and continuous in a back-and-forth direction is opened and closed by a front side door (11) and rear side door (12), and which has a lap portion (15) where a rear end of the front side door (11) and a front end of the rear side door (12) overlap each other in a direction of car width when the front and rear side doors (11, 12) are closed,

characterized in that at the lap portion (15), the rear end of the front side door (11) overlaps the front end of the rear side door (12) to be located on an outer side in the direction of car width with respect to the front end of the rear side door (12),

a front impact bar (27) extending in the back-and-forth direction of the car body is disposed in the front side door (11), and

a rear end of the front impact bar (27) extends to the lap portion (15).

2. The door structure according to claim 1, **characterized in that**

a reinforcing member (25) is disposed in a front end of the rear side door (12) to extend in the vertical direction,

a rear impact bar (26) is disposed in the rear side door (12) to extend in the back-and-forth direc-

tion, and

a front end of the rear impact bar (26) extends to the reinforcing member (25).

3. The door structure according to claim 2, **characterized in that**

the rear end of the front impact bar (27) and the front end of the rear impact bar (26) extend to the lap portion (15) or to a portion in the vicinity of the lap portion (15) to be close to each other.

4. The door structure according to claim 3, **characterized in that**

the reinforcing member (25) forms a closed section, and

the front end of the impact bar (26) is bonded to that portion of the reinforcing member (25) which forms the closed section, to abut thereagainst externally in the direction of car width.

5. The door structure according to claim 4, **characterized in that** the rear end of the front impact bar (27) overlaps that portion of the reinforcing member (25) which forms the closed section in the direction of car width.

6. The door structure according to claim 1, **characterized in that**

a reinforcing member (25) is disposed in a front end of the rear side door (12) to extend in the vertical direction to form a closed section, and

the rear end of the front impact bar (27) extends to a portion in the vicinity of the reinforcing member (25).

7. The door structure according to claim 1, **characterized in that**

the rear side door (12) is swung about a hinge (14) provided at a rear end thereof as a center to open forward,

the front side door (11) is swung about a hinge (13) provided at a front end thereof as a center to open backward, and

in an overlapping state, the front end of the rear side door (12) is covered by the rear end of the front side door (11) externally in the direction of car width, so the rear side door (12) can be opened only when the front side door (11) is open.

8. The door structure according to claim 7, **characterized in that**

in a closed state, the rear side door (12) is locked on the car body at the front end thereof, and in the closed state, the front side door (11) is locked on the front end of the rear side door (12).

9. The door structure according to claim 8, **characterized in that**

door (12) is reinforced by a reinforcing member (25) extending long throughout almost an entire length of the rear side door (12) in a vertical direction.

22. The door structure according to claim 2,
characterized in that

a front end of the front impact bar (27) is disposed to be higher than the rear end thereof, and a rear end of the rear impact bar (26) is disposed to be higher than the front end thereof,

the rear end of the front impact bar (27) and the front end of the rear impact bar (26) are arranged close to each other, and

the front end of the front impact bar (27) and the rear end of the rear impact bar (26) are at substantially the same height.

23. The door structure according to claim 22,
characterized in that the front impact bar (27) is arranged to be inclined downward to the right from the front end thereof to the rear end thereof, and the rear impact bar (26) is arranged to be inclined upward to the right from the front end thereof to the rear end thereof, so as to form a substantial V shape when seen from the car body side portion.

24. The door structure according to claim 22,
characterized in that the front end of the front side door (11) is supported to the car body by a pair of hinges (13) vertically spaced apart from each other by a predetermined distance, and the front end of the front impact bar (27) is attached between the hinges (13).

25. The door structure according to claim 22,
characterized in that the rear end of the rear impact bar (26) is attached below a hinge (14) that supports the rear side door (12) at a rear end thereof.

26. The door structure according to claim 22,
characterized in that the car body side portion has a partition-less opening through which an inner side and outer side of a car compartment communicate with each other when the front side door (11) and rear side door (12) are closed.

27. The door structure according to claim 22,
characterized in that the rear end of the front side door (11) and the front end of the rear side door (12) have engaging portions (31, 41) that engage with each other when the front side door (11) and the rear side door (12) are closed.

28. The door structure according to claim 27,
characterized in that the front impact bar (27) and the rear impact bar (26) are disposed below the engaging portions (31, 41).

29. The door structure according to claim 28,
characterized in that a reinforcing member (25) is provided in the front end of the rear side door (12) to extend in the vertical direction of the car body.

30. The door structure according to claim 29,
characterized in that the front end of the rear impact bar (26) is attached to the reinforcing member (25).

31. The door structure according to claim 22,
characterized in that a reinforcing member (44) is provided in the front end of the front side door (11) to extend in the vertical direction of the car body, the reinforcing member (44) being provided with an opening degree adjusting member (46) which controls the front side door (11) in a pulsed manner at predetermined opening degrees when the front side door (11) is being opened and closed.

FIG. 2

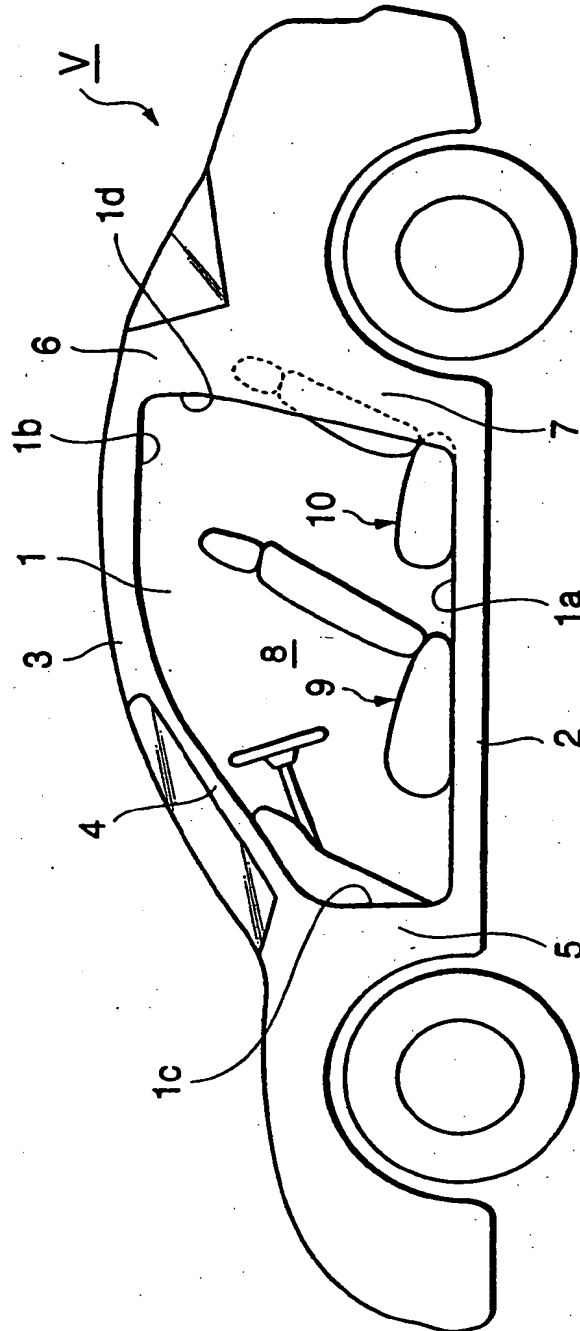


FIG. 4

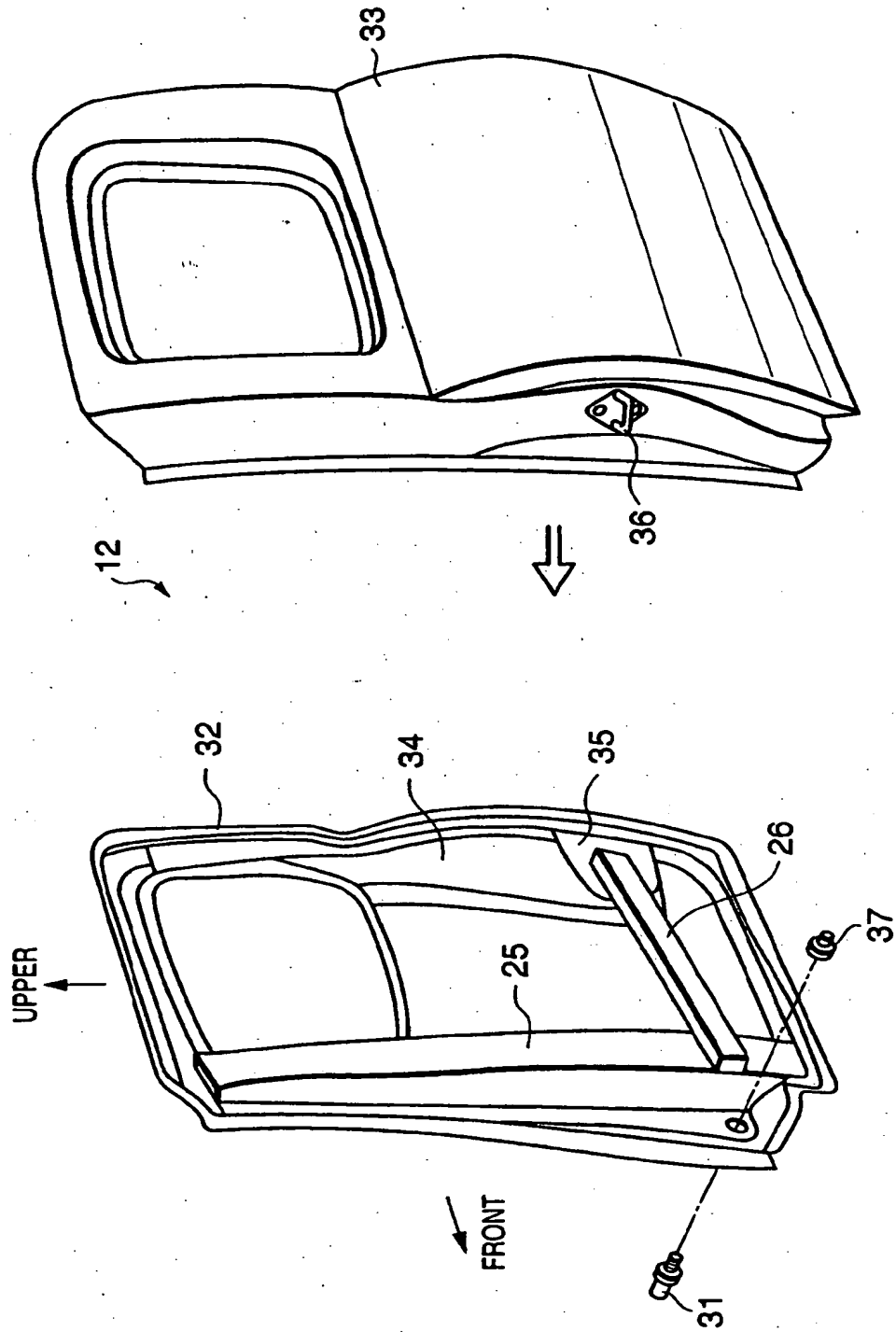


FIG. 6

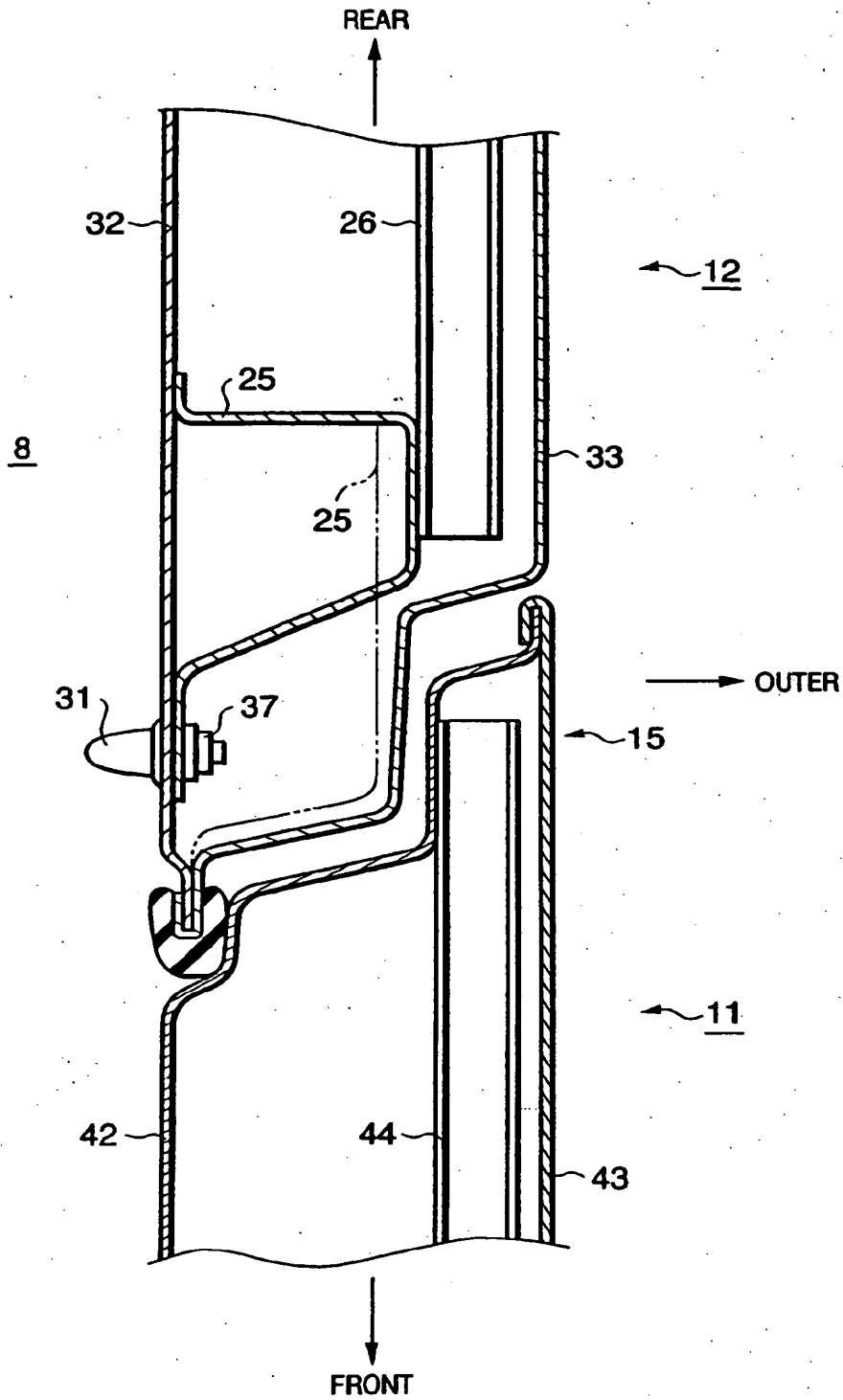


FIG. 8

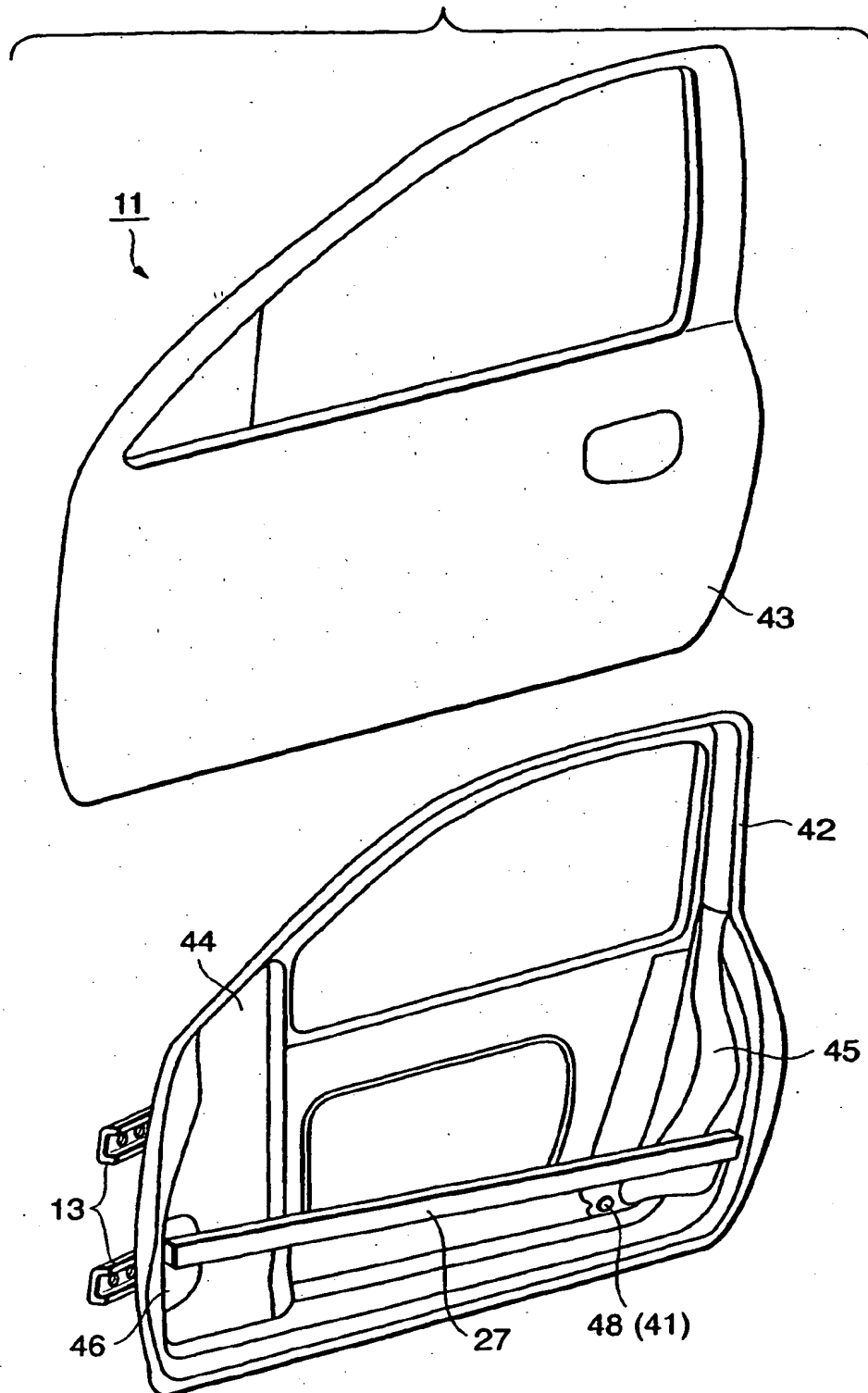
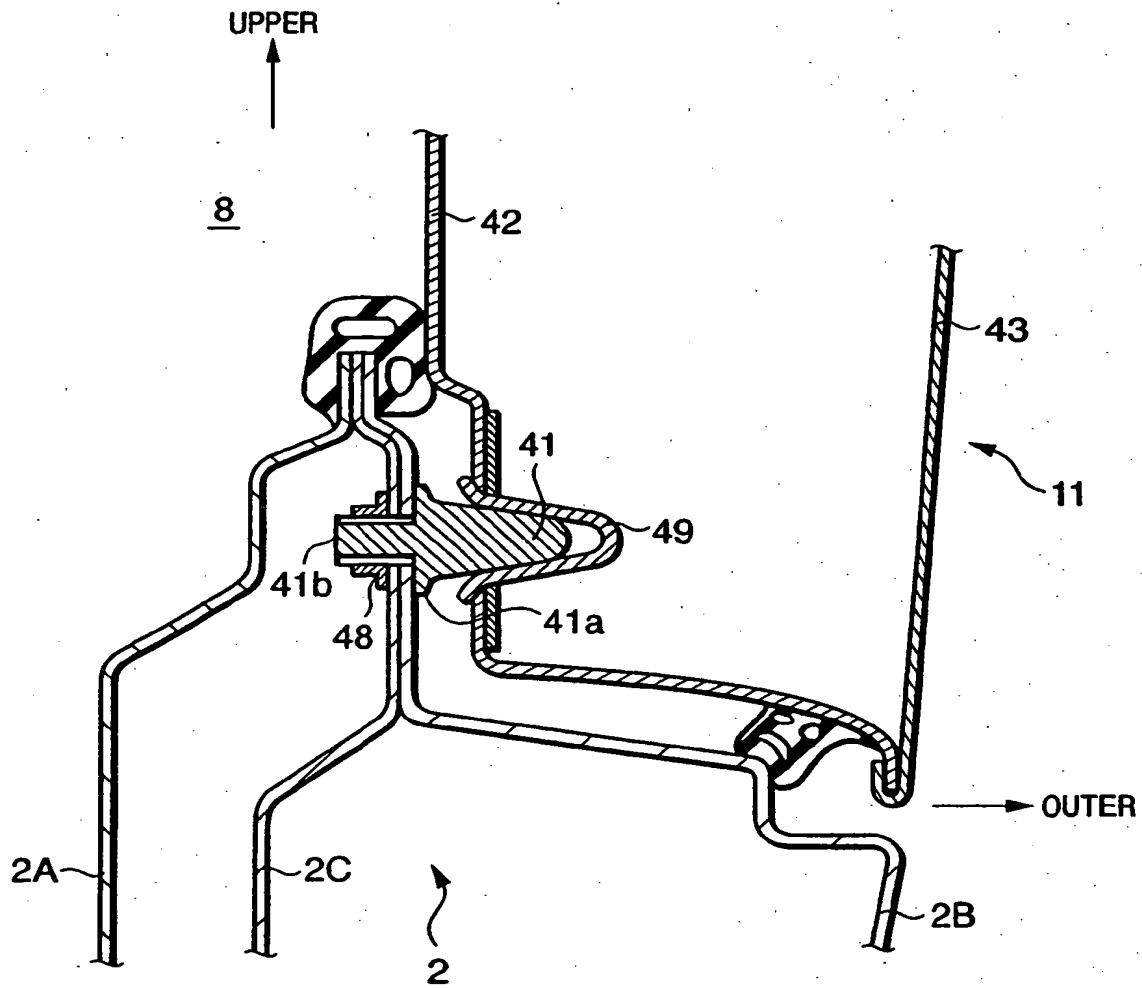


FIG. 10



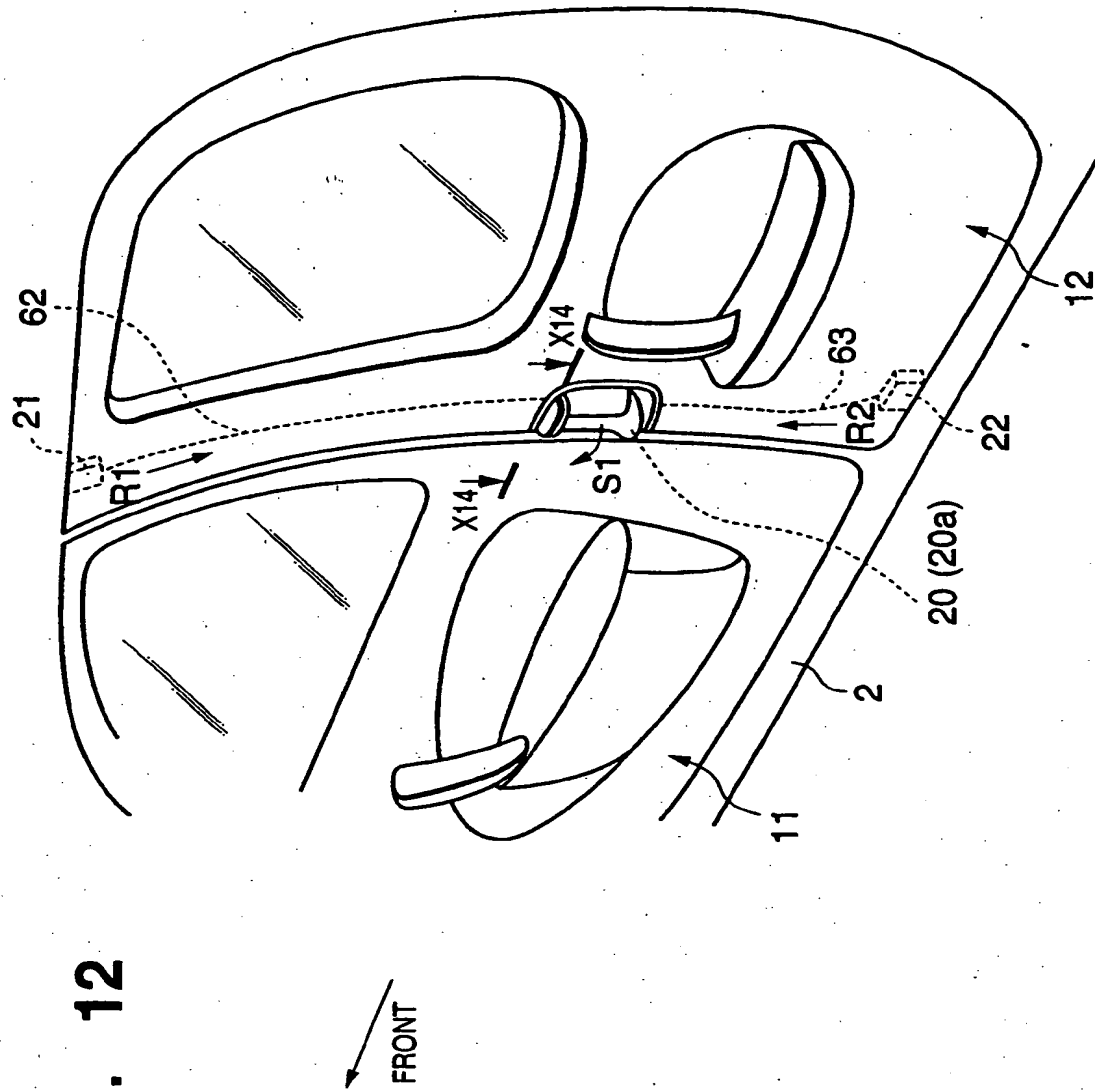


FIG. 14

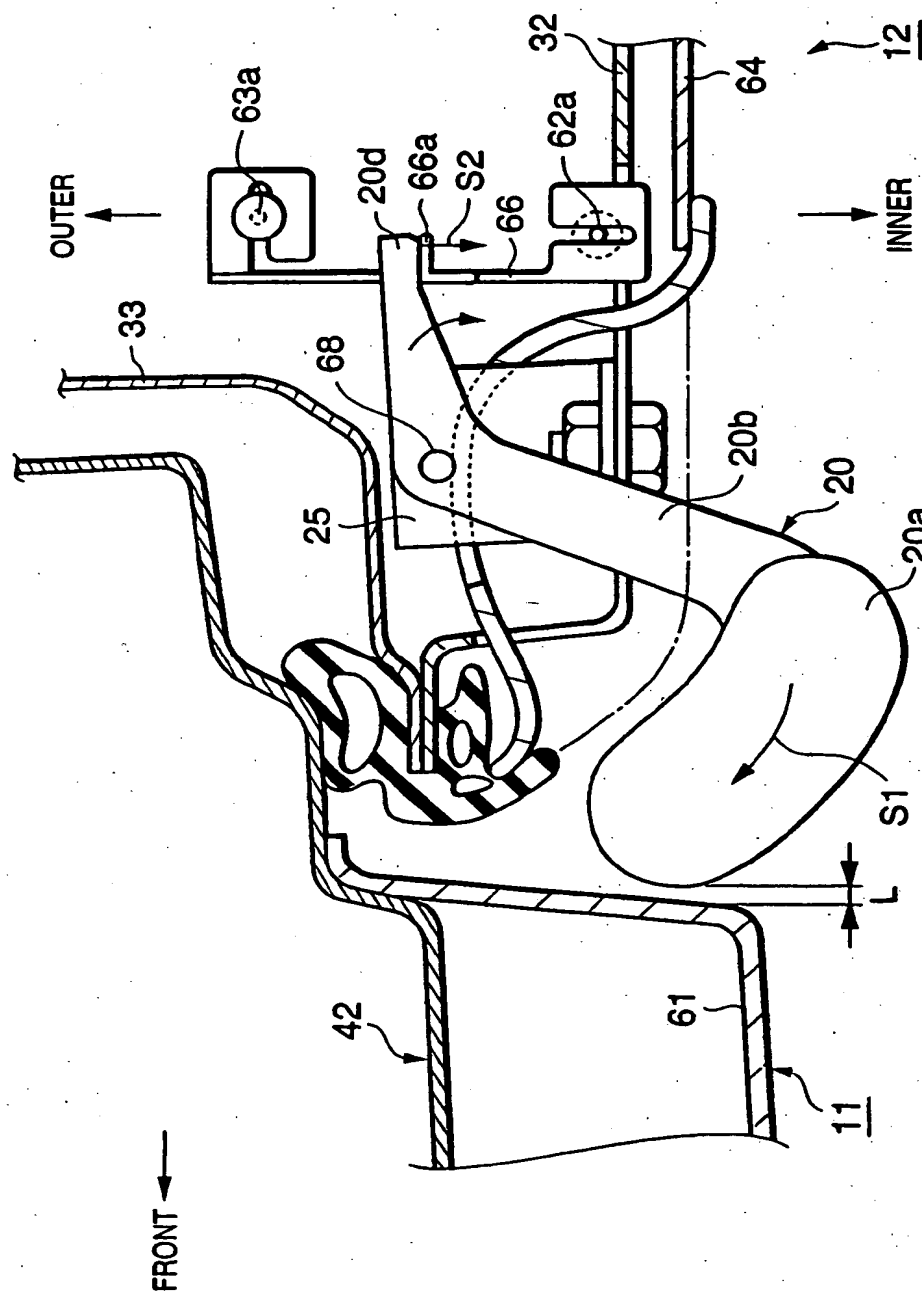


FIG. 16

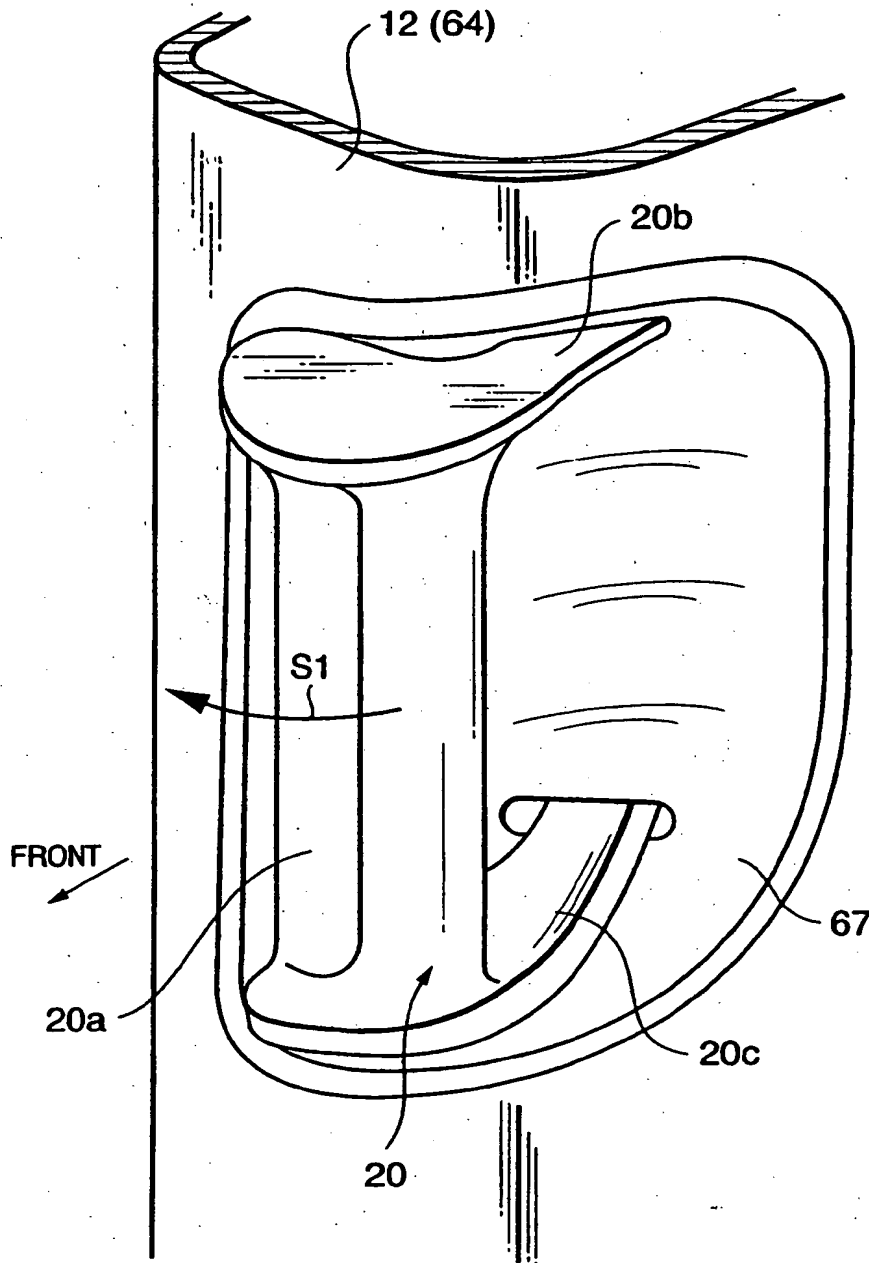


FIG. 18

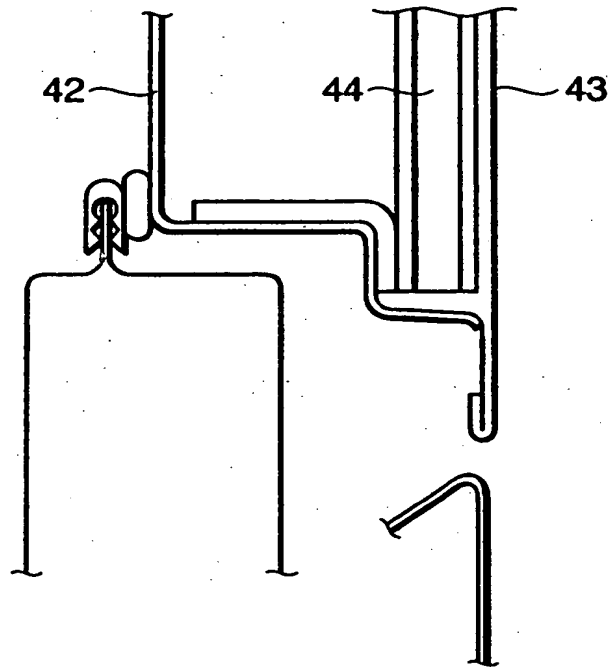
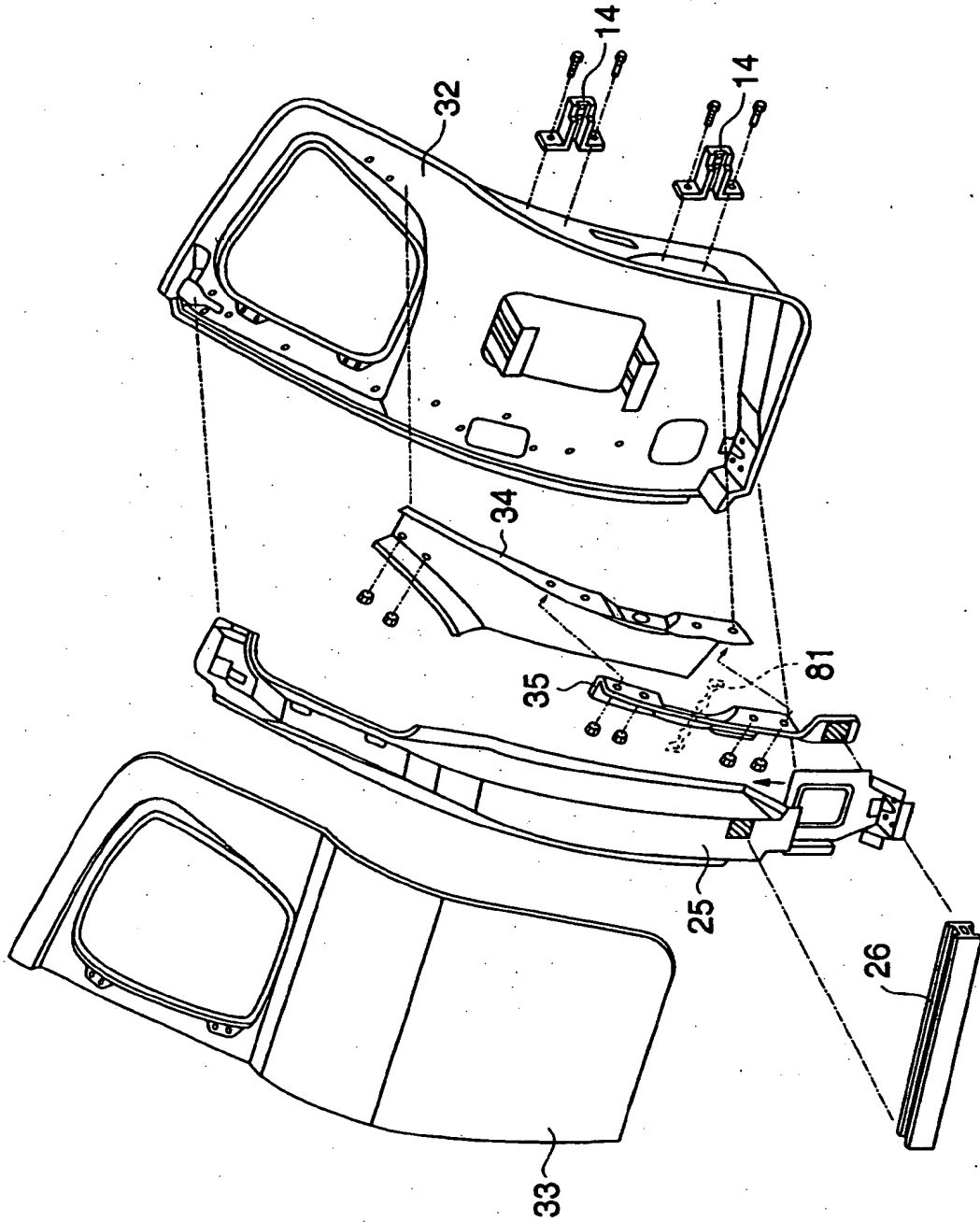


FIG. 20



**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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